# Vibraimage and Artificial Intelligence as Independent Branches of Cybernetics

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***Abstract:*** *The general principles and differences of vibraimage technology (VI) and artificial intelligence (AI) are analyzed. Shown that VI technology has significant differences from AI, and these technologies should be considered as independent areas of cybernetics. The non-use of AI in VI technology in the detection of behavior and recognition of emotions is substantiated by the absence of standard approaches to behavior and emotions now. Described the joint use of VI and AI for medical diagnostics. It is proposed to replace the thesis on the limitations of the use of AI for human research with general requirements for verifying the accuracy of psychophysiology technology, taking into account the probability of errors, sensitivity and specificity. Considered appropriate to limit the impact of ethical restrictions on the processing of biological and physical signals.*

***Keywords:*** *vibraimage, VI, behavioral parameters, artificial intelligence, artificial neural networks, AI, ML.*

## Introduction

Currently, there are several publications mixing the concepts of vibraimage and artificial intelligence (Wright, 2020; 2021; Nash, 2021). The confusion in the heads of non-technical specialists who like to talk about technical innovations and the consequences of their application did not arise by accident, and many people think that vibraimage (VI) technology is based on artificial intelligence (AI). Indeed, VI and AI have many common external features, while the term AI allows different definitions (Minsky, 2003; Nillson, 2009), in contrast to VI, the terminology of which is clearly defined (Minkin, 2007; 2020), but not many understand it. VI as AI has many different applications, which distinguishes VI from a number of physiological signal processing technologies, which usually have one or a limited number of applications. VI is used to solve various questions, for example, to recognize emotions (Minkin, 2020), measure the parameters of the psychophysiological state of a person (Bobrov et al., 2021), control the quality of biological products (Zanco, 2021), control sports achievements (Lutkova et al., 2021), almost everywhere where vibrations and movements carry information about the properties of an object. VI as AI processes and transforms a stream of big data information (Davenport, Barth, Bean, 2012), mainly limited only by processing power. VI takes all information from a video signal, and AI can process any information streams, regardless of the source of their data. VI, like AI, based on cybernetic approaches of digital information processing, although both technologies are using different principles of cybernetics. VI uses more the physical principles of

https://doi.org/10.25696/ELSYS.VC5.EN.02

cybernetics and information theory based on the determination of the optimal signal-to-noise ratio (Wiener, 1948; Shannon, 1948), and AI uses control theory and neural networks (Minsky, 2003; Haykin, 2008; Nillson, 2009) for obtaining the required result. Nowadays, almost all AI technologies use artificial neural networks (ANNs) of one structure or another for decision-making and machine learning (ML) process with or without supervised learning. The first three generations of VI systems do not use neural networks in their structure and do without machine learning (Minkin, 2021a), which means that VI technology differs from AI in its main features.

However, those who like to combine VI and AI do not pay attention to the fundamental differences between these technologies and the fact that the decisions made by VI are determined by human intelligence, which is similar and opposite to AI (Minsky, 2003). VI is typical technology of a measuring device, in which the measurement is carried out according to equations proposed by a person based on the observed physical phenomena and laws (Minkin, 2020). Calling VI technology AI is about the same as calling AI an ordinary digital voltmeter, a speedometer in a car, or a mercury thermometer. This does not mean that an advanced voltmeter cannot use AI technology for some measurements, in the same way, VI technology can use AI to solve complex problems. One of the main functions of AI is machine learning, and nowadays lacks supervised learning to determine emotions and behavior. At present there is no unambiguous understanding of emotions (Fridlund, Russell, 2021), therefore VI determines emotions without using AI. Data mining, is one of AI components, can also be present in technologies for processing physiological signals. For example, vibraimage analogue is the technology of heart rate variability (HRV), which uses intelligence processing of the initial cardiac signal to obtain information about heart rate variability (Baevsky et al., 2001). Therefore, the presence or absence of data mining does not allow unambiguously linking the technology to artificial or human intelligence, as well as big data processing used in both technologies. AI and VI have several common and several distinctive features, therefore, it is more correct to perceive them as different areas of cybernetics, which can complement each other to obtain a higher accuracy in solving the assigned tasks, if a task cannot be solved using one technology.

Currently, many biometric technologies, such as facial identification, are additionally using AI technology to improve accuracy and reduce errors (He et al., 2015). The developers of VI technology use the properties of AI to reveal insignificant but stable connections within a big data in a similar way. At the same time, the following moment surprises me. Considering VI as AI technology do not see the fourth generation of VI systems, where AI, supplements VI technology for example, for medical applications in the diagnosis of COVID-19 (Minkin, Akimov, 2021). When are reliable data applicable for training AI in the form of known PCR results tests, or analyzes of antibodies or CT scans is possible to add supervised learning to VI technology. Although in this case VI works separately, supplying behavioral parameters to AI, and AI uses the behavioral parameters data, and makes a decision based on preliminary training based on the known medical data of the patients and the controls using standard AI tools and methods.

## Behavior detection and emotion recognition using VI without AI

As vibraimage technology developer for the past 20 years, I have experienced different emotions when reading articles by James Wright (Wright, 2020; 2021) about vibraimage. I think these articles may be of interest to readers and open up topical issues of ethics in behavior detection. However, some misunderstandings and errors should be mentioned. First, about the mistakes. I repeat that vibraimage technology is not artificial intelligence technology. It is wrong to mix VI and AI, because vibraimage is based on the well-known principles of physics, cybernetics, physiology and mathematical equations for calculating emotions clearly described in the first patent on vibraimage and the main publications on vibraimage technology (Minkin, Shtam, 2000; Minkin, Nikolaenko, 2008; Minkin, Nikolaenko, 2017; Minkin, 2007; 2020). Now more than 20 years have passed since the priority date of the first VI patent (Minkin, Shtam, 2000), so it is open to users all over the world. To date, Elsys Corp published 6 patents for various methods and devices of vibraimage technology, and all these patents are available for testing, so it is also incorrect to say that vibraimage has algorithmic opacity. Vibraimage technology is similar to other technologies for studying physiological signals, for example, EEG, ECG or HRV. EEG studies the electrical activity of the brain, vibraimage studies the motor activity of the head and the vestibular-emotional reflex (Minkin, Nikolaenko, 2008). There is correlation between EEG signals and vibraimage signals for people with deviations from the normal psychophysiological state (Minkin, 2007). However, no one calls EEG an artificial intelligence technology!

James Wright's second mistake is that he notes that vibraimage technology uses AI to detect behavior and recognize emotions. Vibraimage solutions do not use AI to determine behavior. AI solutions require training, and training requires big data and clear rules for recognizing databases. This combination is suitable for medical diagnostics (there are standard medical tests results for training) and is unacceptable for behavior detection in combination VI and AI (Minkin et al., 2020; Minkin, Kosenkov, 2021; Minkin, Akimov, 2021). There are no world standards for behavior detection and emotion recognition (Fridlund, Russel, 2021) and it is impossible do machine learning AI solution using an algorithm other than vibraimage. There are no high-quality video database for detecting suspicious people other than VI. The scientific status of emotion and behavior detection is open and discussed from different perspectives (Scherer, 2005; Fridland, Russel, 2021). The relationship between vibraimage, cybernetics, and emotions are given in my monograph (Minkin, 2020). This study based on testing about 15,000 people in various psychophysiological states (relaxed, normal, aggressive) and shows the distribution and dependence of 16 emotional and behavioral parameters measured using VI technology. 16 equations for measuring emotions, behavioral and psychophysiological parameters similar to the standard measurement of physical quantities are presented and substantiated. The database of emotions and behavioral parameters measured by the VI technology placed in open access and constantly updated: (http://www.psymaker.com/downloads/CyberVibraV2.zip).

James Wright's second mistake automatically leads to the third — mixing AI problems and behavior detection is simply meaningless. First, because VI technology does not

use AI in detecting behavior and recognizing emotions. Indeed, AI technology has its own problems. AI processing has some opacity in decision making because impossible to control the hidden layers of the ANN. This is one of the main properties of ANN and AI. However, in many cases, AI processing allows you to accurately and quickly identify significant signs and make the right decisions, which is why the use of AI is growing in more applications. For example, when identifying a person by voice and image (He et al., 2015), recognizing emotions by facial expressions (Giannakakis et al., 2021) and with various methods of analysis and diagnosis (El-Rashidy et al., 2021). AI opacity is not so important because AI solutions are usually tested on large databases and error rates are checked. All technical systems have errors (Fawcett, 2006; Minkin, 2019), not only AI systems, and in most cases there are fewer errors of AI applications than errors of other technical systems. Unlike AI, decisions on VI in behavior detection and emotions recognition are transparent, in each case we see detailed reasons for anomalous behavior associated with the deviation of the vibraimage parameters from the statistical norms, for example, by more than 2 SD. This is the standard approach used in physics and mathematical statistics, carried over to behavioral parameters. One of the main characteristics of a physical or technical solution is the error rate, and these error rates can be calculate using transparent processing, as is usually done for biometric identification solutions (Wayman, 2001).

Although VI does not currently use AI to detect behavior and recognize emotions, we will incorporate AI processing into VI technology to detect behavior when we have a technical need. Possible EU restrictions on AI (EU 52021PC0206, 2021) for behavior detection give Chinese, Indian and Russian teams only a competitive edge in this area, although in Russia not everything is simple with the use of AI in healthcare (Gusev et al., 2021). It doesn't matter what algorithm is inside the system (computation or AI), from the point of view of application efficiency, the probability of errors is more important. Therefore, if James Wright and European ethicists want to limit AI decisions related to humans, then it would be more correct immediately go to the Stone Age. Although even then, someone probably considered the stick in the hands of a person to be AI, demanded to limit the length of the stick, and in the end was beaten by this stick.

## Medical diagnosis using VI and AI

The use of AI in medical diagnostics has been actively developing. The current COVID-19 pandemic has significantly accelerated the development of AI technologies for diagnostics, with a variety of information used as input data (El-Rashidy, et al., 2021). The greatest development was received by the use of AI in the processing of X-ray images of CT of the chest to determine the degree of lung damage (Ni et al., 2020). AI used not only to diagnose a disease based on a number of analyses, but also by the automatic input of audio signals (Deshpande, Schuller, 2020; Harvill, 2021) and video processing (Minkin et al., 2020). Initially, seems that the diagnosis of the disease by voice and even more by head micromovements is an absurdity that has no scientific basis. However, if we look at the process of any disease diagnosis from the point of view of physical laws, then we will not see any difference between the

analysis of chest radiographs and the analysis of head micromovements. Is known, that in moderate to severe forms of the disease COVID-19 infection of the lungs occurs, causing physical changes in the structure of the lung tissue, which appear on x-rays of the chest (Ni et al., 2020). Therefore, it is logical to assume that the percentage of lung damage is proportional to the severity of the disease, and this principle is actively used in the diagnosis of COVID-19 (Ni et al., 2020). There are several methods for biochemical detection of COVID-19, for example, RT-PCR testing, having well known of false negative errors problem (Wikramaratna et al., 2020). Physical changes in the lungs of a person with COVID-19 disease cause certain changes in the voice characteristics of patients, especially when coughing, which is also used to diagnose the disease (Harvill et al., 2021; Deshpande, Schuller, 2021). The use of voice characteristics for diagnosing a disease has a number of advantages over biochemical and X-ray diagnostic methods, first, efficiency and simplicity of testing. At the same time, the complexity of identifying stable signs of the disease is such that practically only AI-based methods can reliably separate the audio signals of sick and healthy people. Modern medicine does not deny that all physiological processes in the human body are interconnected and any pathology in one way or another affects the functioning of all physiological systems (Vaitl, 1996). That means the COVID-19 disease also affects the functioning of the vestibular system, which is responsible for the reflex maintenance of the vertical state of the human head. Although this connection is not as obvious as COVID-19 Lung damage The sound of a cough, however head movements dependence from Covid-19 also determines by physical communication (Wiener, 1948). The question remains, how reliably can this connection be detected and how stable are the signs of COVID-19 manifested in micromovements of the head? Vibraimage technology together with AI showed high diagnostic accuracy of COVID-19 (over 94%) by head movement analysis, which confirms the high sensitivity of the vestibular system when infected with the COVID-19 virus (Minkin, Akimov, 2021).

## Discussion

There are many subjective reasons why different people are opposed to and want to restrict the use of AI or VI (Veale, Borgesius, 2021; Gusev et al., 2021; Wright, 2021). Technologies that make decisions for humans or determine human emotions are seen as human opponents. The non-contact and simple psychophysiological detection technology looks so fantastic that it seems fake. In addition, VI was made in Russia, which adds negative associations given to modern Russia in the world. VI also changes the established traditional concepts in several fields of science, such as medicine, psychophysiological detection and recognition of emotions (Minkin, Kosenkov, 2021; Minkin, Blank M., 2021). Of course, these reasons and competitors create many AI and VI opponents. I don't want to convince anyone. My task is to make VI technology better so that programs run faster and make fewer mistakes when making decisions. The founder of analytical psychology Carl Jung said that an introvert and an extrovert will never understand each other (Jung, 2016). We are developing VI technology based on the laws of physics, cybernetics and information theory. Physical laws, like

Newton's laws, are identical in Great Britain and Russia. Physical laws are objective; ethical norms are subjective and different in different countries. It is impossible to have a single ethics for the whole world. We have studied ethnic identity in multiple intelligences profiles in Japan, Iran, and Russia (Nikolaenko et al., 2020) and find joint parts and differences in it. James Wright is an ethicist, and my specialty is physics and information, so based on Jung's approach, we have different views of the same object. There is a great scientist in Britain, Roger Penrose, who won the 2020 Nobel Prize for his discovery that black hole formation is a reliable prediction of general relativity. In my opinion, Roger Penrose was worthy of receiving an earlier Nobel Prize for a number of his work in the physics of consciousness (Penrose, 1996; Hameroff, Penrose, 2014). The physics of consciousness, declared by Penrose with quantum oscillations in microtubules, is closer to vibraimage technology than to ethical issues, and, possibly, empirical measurements using vibraimage technology are partly results of the of quantum gravity effects of Penrose theory.

I do not see a problem that VI results do not correlate with some methods of modern psychological testing (Wright, 2020; Minkin, 2021b). This is normal for several reasons. The main reason is that conscious and unconscious responses to stimuli have different nature, VI calculates both responses, however, most of the psychological testing determines only conscious responses, and most of the psychophysiological testing calculates only unconscious responses. On the other hand, we see more and more independent publications showing a high level of correlation between VI results and the results of well-known psychological or psychophysiological tests (Kosenkov, Sheblanov, 2020; Mizukami, 2021; Deng, Chen; 2021; Tseng, 2021).

## Conclusion

VI as technical profiling system (determining the characteristics of human behavior by technical means) measures and processes real physical effects that take place in human consciousness and the unconscious. Rejecting the results of vibraimage is the same as rejecting Newton's laws because of ethical principles. You can try it, but you cannot stop the apple falling. If I were an ethicist like James Wright or the drafters of the AI act (EU 52021PC0206, 2021), then I would probably be interested in the following question. How many people should die from COVID-19 in order to change the ethical principles that prohibit the transfer of biometric parameters of patients to third parties? The video image needed to create patients and controls databases must be open for researches! Why is possible to create databases of X-ray images of the chest, but it is impossible to have a publicly available database of video images of people's faces, which are so informative for the diagnosis of infection as X-ray images? Naturally, upon obtaining the consent of individuals to use their video images for scientific purposes. I consider any technology that saves lives to be ethical, regardless of whether it uses AI and VI or not. Hindering the development of technologies that can stop COVID-19 pandemic, in my opinion, is not only unethical, but also criminal. The ethical correction of physical laws, mathematical laws and cybernetic principles on which AI and VI are based reminds me of an attempt to create German physics and we know how it ended.

Discrimination of processing algorithms basis on structures reminds me of technical racism. It's a bit strange to talk about racism in the 21st century, when it has become generally accepted that all people are equal regardless of skin color. Now it remains to achieve equality for the algorithms, they should be judged by the results of their work, and not by their internal structure.

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